

Evidence of planetary carbon and oxygen ions in the outer flank of Venus magnetosheath

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On August 10, 2021, the Mercury-bound BepiColombo spacecraft () flew for the second time by Venus for a Gravitationally Assist Maneuver. During this second flyby of Venus, a limited number of instruments were turned on, allowing unique observations of the planet and its environment. Among these instruments, the Mass Spectrum Analyzer (MSA [1]) that is part of the particle analyzer consortium onboard the magnetospheric orbiter (Mio [2]) was able to acquire its first ion composition measurements in space. As a matter of fact, during a limited time interval upon approach of the planet, substantial ion populations were recorded by MSA, with characteristic energies ranging from about 20 eV up to a few hundreds of eVs (Figure 1). Most notably, comparison of the measured Time-Of-Flight spectra with calibration data reveals that these populations are of planetary origin, containing both Oxygen and Carbon ions. The Oxygen observations

are to some extent consistent with previous in situ measurements from the ion mass composition sensor onboard Venus Express and Pioneer Venus Orbiter [3-5]. As for Carbon, we report here the first ever in situ evidences of such an ion species in the near-Venus environment from around 6 planetary radii. Relative to the predominant O⁺, we show that the abundance of C⁺ is about ~30%. Furthermore, changes in the orientation of the magnetic field suggest that these planetary ions are located in the distant magnetosheath flank in the immediate vicinity of the bow-shock region [Hadid et al., submitted].

References

- [1] Delcourt et al., *JGR*, 2016
- [2] Saito et al., *SSR*, 2021
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- [5] Fedorov et al., *JGR*, 2011